

---

---

अस्थायी संक्षारण निवारक उपाय, कठोर फिल्म,  
विलायती निक्षेपिक — विशिष्टि  
( तीसरा पुनरीक्षण )

Temporary Corrosion Preventives,  
Hard Film, Solvent  
Deposited — Specification  
( Third Revision )

ICS 75.100

© BIS 2021



भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS  
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI-110002  
[www.bis.gov.in](http://www.bis.gov.in) [www.standardsbis.in](http://www.standardsbis.in)

## FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Lubricants and their Related Products Sectional Committee and approval of the Petroleum, Coal and Related Products Division Council.

This standard was originally published in 1957 and subsequently revised in 1975 and 2000. This Indian Standard was prepared with a view to facilitate the supply to large and small scale consumers of a material of quality most suited for use under Indian climatic conditions.

This standard forms one of the series of Indian Standard on Temporary Corrosion Preventives, namely, IS 958 : 2000, 'Temporary corrosion preventive grease, soft film (*second revision*)', IS 1154 : 2000, 'Temporary corrosion preventives, soft film, solvent deposited, water displacing' and IS 14779 : 2000 'General purpose oil based temporary corrosion preventives', covering different types of temporary corrosion preventives. Considerable assistance has been derived from these existing standards as well as the British Standard BS 7541 : 1992 'Specification for temporary preventives for the protection of metal surfaces against corrosion during transport and storage' and the Japanese Standard, JIS K 2246-1994 'Rust preventive oils' in the preparation of this standard.

In the second revision (2000), characteristics for appearance, type of film formed, freedom from corrosive properties and resistance to sagging were incorporated. One more grade of the preventive was included. Requirement for drainage and scratch test were dropped.

In this third revision, considerable assistance has been derived from Japanese Standard JIS K 2246-2007 'Rust preventive oils'. Scope of this standard has been modified for more clarity. Requirement of determination of film thickness and its test method are added.

The composition of the technical committee responsible for the formulation of this standard is given in Annex J.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

## *Indian Standard*

# TEMPORARY CORROSION PREVENTIVES, HARD FILM, SOLVENT DEPOSITED — SPECIFICATION

( *Third Revision* )

### 1 SCOPE

This Indian Standard prescribes the requirements and the methods of sampling and tests for temporary corrosion preventives fluid, hard film, solvent deposited suitable for the protection of metal surfaces mainly consist of iron and steel during transport and storage.

### 2 REFERENCES

The following Indian Standards contain provisions, which through reference in this text constitute the provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
170 : 2020	Acetone — Specification ( <i>fifth revision</i> )
410 : 1977	Specification for cold rolled brass sheet, strip and foil ( <i>third revision</i> )
460 (Part 1) : 2020	Test sieves — Specification: Part 1 Wire cloth test sieves ( <i>fourth revision</i> )
513 (Part 1) : 2016	Cold rolled low carbon steel sheet and strips: Part 1 Cold forming and drawing purpose ( <i>sixth revision</i> )
517 : 2020	Specification for methanol (methyl alcohol) ( <i>third revision</i> )
713 : 1981	Specification for zinc base alloy ingots for die casting ( <i>second revision</i> )
737 : 2008	Wrought aluminum and alloy sheet and strip for general engineering purposes ( <i>fourth revision</i> )
1070 : 1992	Reagent grade water — Specification ( <i>third revision</i> )

### *IS No.*

### *Title*

1447 (Part 1) : 2021	Methods of sampling of petroleum and its products: Part 1 Manual sampling ( <i>second revision</i> )
1448	Methods of tests for petroleum and its products
(Part 20) : 2019/ ISO 13736 : 2013	Determination of flash point — Abel closed-cup method ( <i>third revision</i> )
(Part 51) : 1963	Copper strip corrosion test for lubricating greases
(Part 157) : 2018	Rust protections by metal preservatives in the humidity cabinet
537 : 2011	Toluene — Specification ( <i>second revision</i> )

### 3 DEFINITION

For the purpose of this standard, the temporary corrosion preventives are materials used for the protection of metallic surfaces during transportation and storage. These are applied to the metallic surfaces and function by forming protective barriers or other appropriate mode of action at the metal surface. The corrosion preventives are readily removable by hot or cold solvents, wiping, and detergent solutions or stripping.

NOTE — The term temporary signifies ready removability of the corrosion preventive and not the duration of its efficacy. The corrosion preventives should completely wet the metal surfaces and form smooth continuous film when applied by suitable methods.

### 4 REQUIERMENTS

**4.1** The temporary corrosion preventives shall be easily removable by applicable means, such as wiping, action of solvents or detergents or manual stripping. This property shall be retained by the film after aging also.

**4.2** The temporary corrosion preventives shall be homogeneous materials consisting of film forming agents and other ingredients dissolved or dispersed in media as applicable for the different grades. They shall be free from dirt and other visible impurities and shall not contain any separated water.

**4.3** The temporary corrosion preventives shall also comply with the requirements given in Table 1 when tested according to the methods given in Parts of IS 1448, given in column 4 of Table 1.

#### 4.4 Keeping Quality

When stored in the original sealed containers under normal ambient conditions, the temporary corrosion preventives shall retain their properties and shall meet the requirements covered in this standard for the corresponding grades for a period of at least 12 months from the date of delivery.

### 5 PACKING AND MARKING

#### 5.1 Packing

Material shall be packed in suitable containers of appropriate size as agreed to between the purchaser and the supplier.

#### 5.2 Marking

**5.2.1** Material shall be marked with the following information:

- Name and type of material;
- Manufacturer's name, initials or trade-mark, if any;
- Net mass of material;

- Identification in code or otherwise to enable the lot of consignment or manufacture to be traced back from records; and

- Any other statutory requirements.

#### 5.2.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

### 6 SAMPLING

**6.1** Representative samples of the material shall be drawn as prescribed in IS 1447 (Part 1).

**6.2 Number of Tests** — Tests for determining all the characteristics given in Table 1 of the standard shall be conducted on the composite sample.

**6.3 Criteria for Conformity** — The lot shall be declared as conforming to the requirements of this standard, if all the test results on the composite sample satisfy the requirements of this standard.

**Table 1 Requirement for Temporary Corrosion Preventive Hard Film, Solvent Deposited**  
( Clause 4.3 )

SI No.	Characteristic	Requirement for	Method of Test, Ref to Annex/P of IS 1448
(1)	(2)	(3)	(4)
i)	Appearance at 25/30 °C	Report	Visual examination
ii)	Type of film formed	Thin, tough and non-sticky	do
iii)	Flash Point, °C (Abel), <i>Min</i>	38	(Part 20)
iv)	Drying time	Pass the test	A
v)	Low temperature flexibility	do	B
vi)	Adhesion and stickiness	do	C
vii)	Humidity cabinet test, h, <i>Min</i>	360	(Part 157)
viii)	Freedom from corrosive properties		
	a) Metal couples	No Corrosion	D
	b) Copper (50 °C, 3h), <i>Max</i>	1	(Part 51)
	c) Lead, ass change, mg/cm <sup>3</sup> , <i>Max</i>	1	E
ix)	Resistance to sagging	Pass the test	F
x)	Stability	Pass the test	G
xi)	Film thickness (μ)	Report	H

## ANNEX A

[ Table 1, SI No. (iv) ]

## METHOD OF TEST FOR THE DETERMINATION OF DRYING TIME

## A-1 MATERIALS

## A-1.1 Mild Steel Panel

The mild steel test panels required for this test shall be of panel sheet (drawing type) specified in IS 513 (Part 1). The panel shall be approximately  $76 \times 38 \times 1.3$  mm in size and shall have 6 mm diameter hole, drilled centrally near one of the shorter edges. The panel shall be free from mill scale or oxides, pits, scratches or surface imperfections.

## A-1.2 Sand

Clean, dry, white sand, which completely passes through 300 micron IS Sieve but is completely retained by 150 micron IS Sieve shall be used (*see* IS 460).

## A-1.3 Camel Hair Brush

## A-1.4 Carborundum Powder (No. 150).

## A-1.5 Toluene — Sulphur free, confirming to IS 537.

**A-1.6 Methanol** — The methanol shall be water white and not less than 98 percent (by column) in strength. It shall not contain more than traces of aldehydes and acids (*see* IS 517).

## A-2 PREPARATION OF THE PANEL

Polish the panel on both sides by means of a pad of filter paper and carborundum powder and then degrease with toluene. Rinse the panel with methanol and then dry for a few minutes in a stream of warm, dry air. During and after degreasing care shall be taken not to handle the test surface with bare hands.

## A-3 PROCEDURE

**A-3.1** Immerse the mild steel panel in the corrosion preventive at room temperature for 2 min. Remove the panel and allow to drain at room temperature and 60 to 70 percent relative humidity in vertical position for 4 h in a well-ventilated place and out of direct sunlight. Place the panel in a horizontal position and sprinkle sand on the panel from a height of 100 mm. Leave the panel with the sand undisturbed for 2 min and lightly brush the panel with the camel hair brush.

**A-3.2** The temporary corrosion preventive shall be taken to have satisfied the requirement of the test, if the sand is completely removed by brushing.

## ANNEX B

[ Table 1, SI No. (v) ]

## TEST FOR LOW TEMPERATURE FLEXIBILITY

## B-1 APPARATUS

An apparatus with suitable dimensions for carrying out the test is shown in Fig. 1.

## B-2 MATERIALS

**B-2.1 Test Panel** — The panel required for this test shall be made from tin plate of approximately  $75 \times 25 \times 0.5$  mm in size. The panel shall have a 6 mm diameter hole drilled centrally near one of the shorter edges.

## B-2.2 Toluene — Sulphur free, confirming to IS 537.

## B-2.3 Methanol — Same as described under A-1.6.

## B-3 PREPARATION OF TEST PANEL

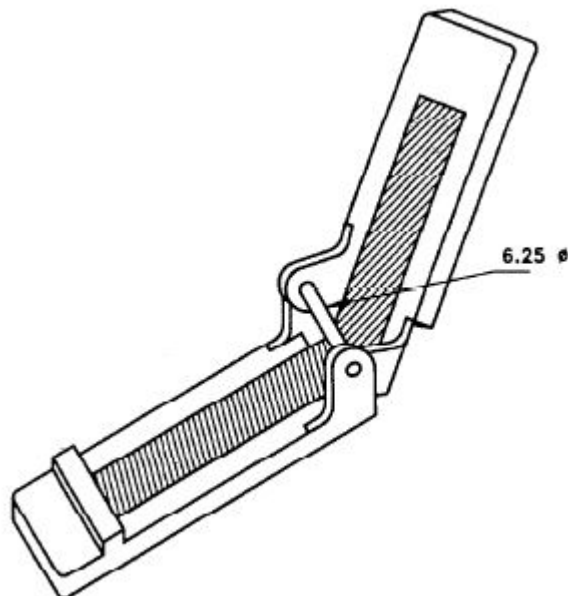
Thoroughly clean and degrease the panel by swabbing vigorously with pieces of clean cloth or filter paper soaked in toluene. Rinse the panel in methanol and then dry for a few minutes in a stream of dry air. During and after degreasing, care shall be taken not to handle the test surface with bare hands.

## B-4 PROCEDURE

**B-4.1** Immerse the test panel in the corrosion preventive at room temperature for 2 min. Suspend the panel from a glass hook and keep it in a vertical position for 24 h at room temperature and 60 to 70 percent relative humidity in a well-ventilated place and out of direct sunlight.

Remove the panel and subject it to a temperature of 0 °C for 1 h and, while at this temperature, bend quickly through an angle of 180 degree over a 6.25 mm rod using an apparatus similar to that illustrated in Fig. 1 and previously cooled to 0 °C.

**B-4.2** The corrosion preventive shall be taken to have satisfied the requirement of the test if the film does not rupture, flake or crack.



All dimensions are in mm

FIG. 1 APPARATUS FOR DETERMINING FLEXIBILITY

## ANNEX C

[ Table 1, Sl No. (vi) ]

### TEST FOR ADHESION AND STICKINESS

#### C-1 MATERIALS

##### C-1.1 Mild Steel Panel

The mild steel test panels required for this test shall be of panel sheet (drawing type) specified in IS 513 (Part 1). The panel shall be approximately 76 × 100 × 1.3 mm in size and shall have a 6 mm diameter hole, drilled centrally near one of the shorter edges. The panel shall be free from mill scale or oxides, pits, scratches or surface imperfections.

##### C-1.2 Carborundum Powder (No. 150).

##### C-1.3 Toluene — Sulphur free, confirming to IS 537.

##### C-1.4 Methanol — Same as described under A-1.6.

##### C-1.5 Paper — Smooth, machine glazed craft paper of 75 g/m<sup>2</sup> substance DC.

#### C-2 PREPARATION OF PANEL

Polish both sides of the panel by means of a pad of filter paper and carborundum powder, and then degrease with toluene. Rinse the panel with methanol and then dry for a few minutes in a stream of warm, dry air. During and after degreasing care shall be taken not to handle the test surface with bare hands.

#### C-3 PROCEDURE

**C-3.1** Immerse the test panel in the corrosion preventive at room temperature for 2 min. Suspend the panel from a glass hook and keep it in a vertical position for 24 h at room temperature and 60 to 70 percent relative humidity in a well-ventilated place and out of direct sunlight. Remove the panel and place it on a flat surface in a horizontal position at room temperature. Place over the panel a strip of paper at least as large as the panel.

Then place a piece of felt  $34 \times 34$  mm and 6 mm thick on the paper over the center of the panel and a 1 kg weight on the felt. Remove the felt and the weight after 1 h, and pull the paper rapidly from the surface of the coated panel. The test shall be conducted at room temperature.

**C-3.2** The corrosion preventive shall be taken to have satisfied the requirement of the test if the film of the temporary corrosion preventive is not damaged to the extent that bare metal is exposed and the paper used does not tear on removal.

## ANNEX D

[ Table 1, *Sl No.* (viii) (a) ]

### METHOD OF TEST FOR FREEDOM FROM CORROSIVE EFFECT ON METAL COUPLES

#### D-1 APPARATUS

**D-1.1 Oven** — The oven shall be thermostatically controlled and capable of maintaining a temperature of  $50 \pm 1$  °C.

**D-1.2 Glass Containers** — Four suitable wide-mouthed heat-resistant glass containers, fitted with vented corks, shall be used.

#### D-2 MATERIAL

**D-2.1 Test Panels** — The test panels of  $50 \times 25$  mm shall be of the following metals and composition.

**D-2.1.1 Mild Steel** — The mild steel test panels required for this test shall be of panel sheet (drawing type) specified in IS 513 (Part 1).

**D-2.1.2 Brass** — The brass test panels shall have the composition as prescribed for grade Cu Zn 37 of IS 410.

**D-2.1.3 Aluminium Alloy** — The aluminium alloy test panels shall have the composition as prescribed for grade HS 14 or grade HS 15 specified in IS 737.

**D-2.1.4 Magnesium Alloy** — The magnesium alloy test panels shall have the following composition:

a) Aluminium, percent by mass, <i>Max</i>	0.05
b) Zinc percent by mass, <i>Max</i>	0.03
c) Manganese, percent by mass	1.0 to 2.0
d) Copper, percent by mass, <i>Max</i>	0.02
e) Silicon, percent by mass, <i>Max</i>	0.02
f) Iron, percent by mass, <i>Max</i>	0.03
g) Nickel, percent by mass, <i>Max</i>	0.005
h) Calcium, percent by mass, <i>Max</i>	0.02
j) Magnesium, percent by mass	Remainder

**D-2.1.5 Zinc Base Alloy** — This zinc base alloy test panels shall have the composition as prescribed in IS 713.

**D-2.1.6** The pair of metals concerned shall be drilled centrally to accommodate a nut and bolt which shall be of brass, except in the case of mild steel aluminium alloy couple, where a steel nut and bolt shall be used. The pair of metals shall be clamped firmly together in the form of a cross with an angle of 20 degree between their major axes before the test.

**D-2.2 Emery Cloth** (No. 0).

**D-2.3 Toluene or Acetone** — Confirming to IS 537 or IS 170.

**D-2.4 Methanol** — Same as described in A-1.6.

#### D-3 CLEANING OF METAL PANELS

Burnish the metal panels with emery cloth (in the case of magnesium and aluminium alloys, moist pumice powder shall be used) to a smooth bright finish. Clean and degrease by swabbing with cloth soaked in toluene or acetone and then rinse with methanol (*see* Note). Finally, dry the metal panels in a current of warm, dry air and immediately utilize for the test. During and after degreasing, do not touch the metal panels by bare hands, but handle with a pair of clean forceps. Clean and degrease the nuts and bolts before use.

NOTE — In the case of magnesium alloy, dry methanol shall not be used.

#### D-4 PROCEDURE

**4.1** Take sufficient quantity of temporary corrosion preventive in each of the four glass containers and introduce one metal couple in each of the containers such that half the length of the metal couples is immersed in the corrosion preventive. Close the glass containers with the vented corks and place them in



the oven maintained at  $50 \pm 1^\circ\text{C}$  for 6 h. Remove the glass containers from the oven and take out the metal couples from the containers. Separate the metal panels of couples. Remove the film of temporary corrosion preventive by swabbing the metal panels with cloth soaked in toluene or acetone and visually examine for corrosion.

4.2 Express the variation in mass of the test piece. Report the appearance of the test piece for roughness, appearance or other unusualness found on the surface of each test piece.

## ANNEX E

[ Table 1, *Sl No.* (viii) (c) ]

### METHOD OF TEST FOR CORROSIVE EFFECT ON LEAD

#### E-1 APPARATUS

**E-1.1 Oven** — The oven shall be thermostatically controlled and capable of maintaining a temperature of  $50 \pm 1^\circ\text{C}$ .

**E-1.2 Glass Container** — A wide-mouthed glass container fitted with liquid-tight ground-glass stopper shall be used. Its capacity shall be approximately 500 ml and it shall be made from heat-resistant glass.

#### E-2 MATERIAL

##### E-2.1 Lead Test Panels

The test panels shall have the following composition:

a) Metallic lead, percent by mass, <i>Min</i>	99.99
b) Copper, percent by mass, <i>Max</i>	0.003
c) Antimony, percent by mass, <i>Max</i>	0.002
d) Bismuth, percent by mass, <i>Max</i>	0.005
e) Iron, percent by mass, <i>Max</i>	0.003
f) Nickel and cobalt together, percent by mass, <i>Max</i>	0.001
g) Silver, percent by mass, <i>Max</i>	0.002
h) Zinc, percent by mass, <i>Max</i>	0.002
j) Tin, cadmium, arsenic and sulphur	Traces
k) Total of all impurities present, percent by mass, <i>Max</i>	0.01

**E-2.1.1** The Panel shall be approximately  $75 \times 50 \times 1.5$  mm in size and shall be free from deep scratches and surface imperfections.

**E-2.2 Toluene or Acetone** — Confirming to IS 537 or IS 170.

**E-2.3 Methanol** — Same as described in A-1.6.

**E-2.4 Dilute Acetic Acid** — Approximately 1 percent by volume.

#### E-3 CLEANING OF LEAD PANELS

Clean the panels on both sides and on all edges to a smooth bright finish by scraping with a sharp tool. Clean and degrease by swabbing with a cloth saturated with toluene or acetone and then rinse with methanol. Finally, dry the panels in a current of warm, dry air. During and after degreasing, do not handle the panel by bare hands, but with a pair of clean forceps.

#### E-4 PROCEDURE

**E-4.1** Carry out the test in triplicate.

**E-4.2** Weigh each panel accurately. Place the weighed lead panels in the glass containers and add sufficient quantity of the corrosion preventive such that the panels are immersed to a depth of 12 mm below the surface of the corrosion preventive. Close the container with the stopper and place it for 8 h in the oven maintained at  $50 \pm 1^\circ\text{C}$ . Remove the container from the oven, withdraw the panels and cool. Remove the film of corrosion preventive by swabbing lightly with cotton wool soaked in toluene or acetone. Dip the panels in boiling dilute acetic acid for 1 to 2 min rinse with water, dry and weigh.

**E-4.3** Express the average loss in mass of the panels in milligrams per square centimeter of surface.



## ANNEX F

[ Table 1, Sl No. (ix) ]

## METHOD OF TEST FOR RESISTANCE TO SAGGING

**F-1 METHOD OF TEST FOR SAG OF PRODUCT FILM AT 80 °C****F-1.1 Preparation of Test Panel**

Successively abrade, to a fine circular finish, with grades P180 and P240 aluminium oxide metal working cloth with backing having breaking strength warp way, minimum 961 N and weft minimum 392 N, a mild steel test panel of dimensions  $150 \times 100 \times 1.2$  mm, that is free from surface imperfections, and has two 6 mm hole drilled centrally 6 mm from either of the shorter sides. Clean and degrease the panel. Partially mask the prepared face of the panel with a strip of masking tape 25 mm wide. Apply the tape centrally across the panel and parallel to the shorter sides. Apply the temporary protective to the panel by dipping or brushing as appropriate and allow drying for 24 h.

**F-1.2 Test Method**

Remove the strip of masking tape from the test panel, suspend the panel vertically by means of a hook in an air oven controlled at  $80 \pm 2$  °C for a period of 48 h. Remove the panel from the oven and allow to cool in a vertical position for 1 h. Measure the minimum width of the uncoated area of the test panel at  $25 \pm 1$  °C in mm and subtract the result from 25. Record the result to the nearest mm.

**F-1.3** When the coated film exceeds 3 mm, then the test should be repeated. After repeating if the variation is more than 3 mm then the sagging point is lower than the specified temperature.

## ANNEX G

[ Table 1, Sl No. (x) ]

## METHOD OF TEST FOR STABILITY

**G-1 APPARATUS**

The equipment required for this test shall consist of the following.

**G-1.1 Oven** — The oven shall be thermostatically controlled and capable of maintaining a temperature of  $50 \pm 1$  °C.

**G-1.2 Test Tube** — The test tube shall be  $150 \pm 10$  mm in height and  $25 \pm 5$  mm in diameter. It shall be made from heat resistant glass and shall be fitted with a vented cork.

**G-1.3 Thermometer** — The thermometer shall be, such as to read accurately the required temperature within  $\pm 1$  °C.

**G-2 CLEANING OF THE TEST TUBE**

Clean the test tube with concentrated solution of chromic acid, and then rinse with distilled water (see IS 1070), till free from acid and finally air dry.

**G-3 PROCEDURE**

**G-3.1** Fill the test tube to within 25 mm of the top with the corrosion preventive. Close the tube with the vented cork and then subject it to the temperature cycle stated below:

- a) 2 h at  $0 \pm 1$  °C;
- b) 2 h at  $50 \pm 1$  °C;
- c) 20 h at room temperature.

**G-3.2** Repeat the above cycle on three consecutive days and then allow the tube to stand undisturbed for a further period of 3 days at room temperature. Examine the contents of the tube for separation into layers or sedimentation.

**G-3.3** The corrosion preventive shall be taken to have satisfied the requirement of the test if there is no separation of layers or sedimentation.

## ANNEX H

[ Table 1, Sl. No (xi) ]

## DETERMINATION OF FILM THICKNESS

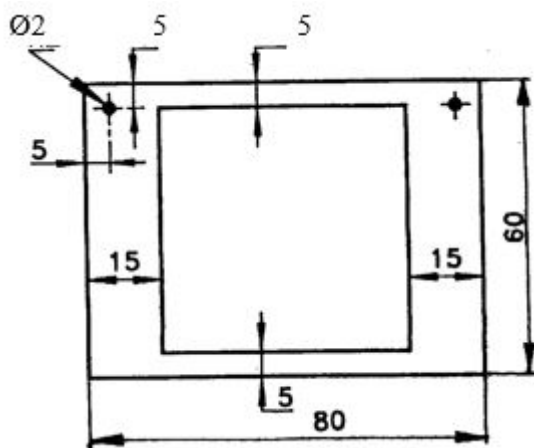
## H-1 GENERAL

Testing by the gravimetric method is specified herein, but other suitable methods may also be employed.

**H-1.1** Sampling shall be performed in accordance with IS 1447 (Part 1).

## H-2 MATERIALS

**H-2.1 Test Pieces** — Three number of pieces of steel sheet or strip conforming to IS 513 (Part 1) and of dimensions  $(1.0 \text{ to } 2.0) \times 60 \times 80$  mm. As required test pieces shall respectively be provided with a hole of 2 mm diameter at two locations for their suspension (see Fig. 2).



All dimensions in millimeters

FIG. 2 TEST PIECE

## H-3 PREPARATION OF TEST PIECES

**H-3.1 Grinding** — Test pieces shall be ground on both sides in dry condition with abrasive cloth or abrasive paper and the edges shall be rounded at the same time. The direction of final grinding shall be parallel to the short sides exclusively for those test pieces used in the test (see Note) and parallel to the long sides for other test pieces.

**H-3.2 Cleaning** — Test pieces shall be immersed in warm petroleum naphtha and then in warm anhydrous methanol to be cleaned until no stains attach to the gauze used for wiping.

**H-3.3 Preservation** — When test pieces are not intended for immediate use for the test, they shall be kept in a desiccator. However, those test pieces elapsed for 24 h or longer after preparation shall be re-prepared for the test.

## H-4 REPAIRING OF COATED TEST PIECES

## H-4.1 Coating

The operation of coating with the rust preventive oil shall be performed at a relative humidity of 50 percent or lower and a temperature of  $25 \pm 1^\circ\text{C}$ . The rust preventive oil shall be put in the container used for coating in such a quantity as to completely immerse the test pieces and thoroughly mixed with stirring. The foam accumulated on the surface shall be removed. Steel test pieces shall be according to Fig. 2. It shall be immersed in the container holding the oil for 1 min and then withdrawn at a rate of 100 mm per min.

## H-4.2 Method of Drying

The coated test pieces shall be naturally dried for 24 h in suspended condition in a clean place until they are subjected to the film thickness and other tests.

## H-5 DETERMINATION OF FILM DENSITY

25 g of sample shall be placed in a flat-bottomed evaporating dish of 90 mm in inner diameter and maintained at  $107 \pm 2^\circ\text{C}$  for 16 h in an explosion proof air bath. By using the evaporation residue as the test sample (see Note) the film density shall be obtained by the pycnometer method at  $25 \pm 1^\circ\text{C}$ .

NOTE — Where the evaporation residue obtained in one operation is less than 25 ml, the evaporation residue obtained in two or more operations shall be used as the test sample.

## H-6 CALCULATION

The film thickness of the coated test pieces shall be calculated from the following formula:

$$\text{Film thickness (micron)} = \frac{10000 \times M}{D \times A}$$

where

M = mass of film,  $(W_2 - W_1)$ , in g;

$W_1$  = mass of the test piece before coating, in g;

$W_2$  = mass of the test piece after coating, in g;

D = density of film, in  $\text{g/cm}^3$ ; and

A = total surface area of test piece, in  $\text{cm}^2$ .

**ANNEX J***( Foreword )***COMMITTEE COMPOSITION**

Lubricants and Their Related Products Sectional Committee, PCD 25

<i>Organization</i>	<i>Representative(s)</i>
Gulf Oil Lubricants India Ltd, Mumbai	DR. Y. P. RAO ( <b>Chairman</b> ) SHRI GIRISH JANGE ( <i>Alternate</i> )
Ashok Leyland Ltd, Chennai	SHRI D. BALAKRISHNAN SHRI RAVI M. ( <i>Alternate</i> )
Bajaj Auto Ltd, Pune	SHRI K. RAJAN SHRI DEEPESH MUTKE ( <i>Alternate</i> )
Balmer Lawrie & Co Ltd, Kolkata	DR BALARAM GHOSH DR M. L. DAS ( <i>Alternate</i> )
Bharat Petroleum Corporation Ltd, Mumbai	SHRI DEBASHIS GANGULI
Castrol India Ltd, Mumbai	SHRI ASHISH GONDAL SHRI RAMAN RAI ( <i>Alternate</i> )
Centre for High Technology, New Delhi	SHRI BRIJESH KUMAR SHRI SUSHOBHAN SARKAR ( <i>Alternate</i> )
Chennai Petroleum Corporation Ltd (CPCL), Chennai	DR V. SELVAVATHI H. RAMAKRISHNAN ( <i>Alternate</i> )
Central Pollution Control Board, (Ministry of Environment & Forests), New Delhi	SHRI DINABANDHU GOUDA
Consumer Guidance Society of India, Mumbai	DR SITARAM DIXIT DR M. S. KAMATH( <i>Alternate</i> )
Hero Moto Corp Ltd, Gurugram	SHRI AJAY GUPTA
Hindustan Petroleum Corporation Ltd, Mumbai	DR A. K. JAIN SHRI SUKANTA BANERJEE ( <i>Alternate</i> )
Indian Additives Ltd, Chennai	SHRI AANISH DWARKADAS SHRI SRIKANTHAN ( <i>Alternate</i> )
Indian Institute of Petroleum, Dehradun	SHRI A. K. JAIN SHRI G. D. THAKRE ( <i>Alternate</i> )
Indian Oil Corporation (R & D), Faridabad	DR DEEPAK SAXENA DR PANKAJ BHATNAGAR ( <i>Alternate</i> )
Indian Oil Corporation Ltd, (Marketing Division), Mumbai	SHRI SANJEEV KUNDU DR A. S. KATHAIT ( <i>Alternate</i> )
Indian Oil Corporation Ltd, (Refineries), New Delhi	SHRI ASHWANI SHARMA SHRI R. K. CHUGH ( <i>Alternate</i> )
Lubrizol India Ltd, Mumbai	SHRI ANAND REDKAR SHRI D. S. PADMANABHAN ( <i>Alternate</i> )
Mahindra & Mahindra Ltd, Chennai	SHRI R. RAMAPRABHU
Maruti Udyog Ltd, Gurugram	SHRI ASHOK PERMUDE SHRI NARINDER KUMAR ( <i>Alternate</i> )
DRDO, Ministry of Defence, Ahmednagar (Maharashtra)	SHRI C. V. PANDEY

<i>Organization</i>	<i>Representative(s)</i>
RDSO, Ministry of Railways, Lucknow	SHRI RAJESH SRIVASTAVA SHRI SONAM GUPTA ( <i>Alternate</i> )
Ministry of Road Transport & Highways, New Delhi	SHRI G. SHARAN SHRI S. S. NAHAR ( <i>Alternate</i> )
Bosch Ind Ltd, Bengaluru	SHRI A. FREDRICK SHRI D. RAMARAJU ( <i>Alternate</i> )
National Test House, Kolkata	DR S. N. BANDYPPADHYAY DR UMESH SINGH ( <i>Alternate</i> )
Reliance Industries Limited, Mumbai	SHRI ADVAIT ANASPURE
Society of Indian Automobile Manufacturers, New Delhi	SHRI P. K. BANERJEE SHRI ATANU GANGULI ( <i>Alternate</i> )
Steel Authority of India Ltd, New Delhi	SHRI G. CHAKRAVARTI
Swastik Oil Products Mfg Co Pvt Ltd	SHRI BHUPENDRA RATHOD SHRI SANAT RATHOD ( <i>Alternate</i> )
Tata Motors Ltd, Pune	SHRI P. B. DAKHOLE SHRI S. B. GUDEKAR ( <i>Alternate</i> )
TVS Motor Company Ltd, Hosur, Tamil Nadu	SHRI AJITH KUMAR
Afton Chemicals, Mumbai	SHRI JEENAL PATEL
FSSAI, New Delhi	NOMINATED AWAITED
DGMS, Dhanbad	NOMINATED AWAITED
NETRA	SHRI P. K. JAIN
BHEL(R&D), Hyderabad	NOMINATED AWAITED
SAIL, Ranchi	SHRI ANUJIT RITURAJ SHRI BALAKRISHNA BISOIYI ( <i>Alternate</i> )
ISMA	NOMINATED AWAITED
BASF India Limited	MS ANJU SHARMA SHRI ASHOK SAMBANDAM ( <i>Alternate</i> )
PCRA	SURENDRA PRATAP SHRI M. P. BANGWAL ( <i>Alternate</i> )
BIS Director General	SHRI V. K. DIUNDI, SCIENTIST 'F' AND HEAD (PCD) [REPRESENTING DIRECTOR GENERAL ( <i>Ex-officio</i> )]

*Member Secretary*

SHRIMATI NAGAMANI T.  
SCIENTIST 'D', PCD, BIS

## Automotive and Industrial Greases Subcommittee, PCD 25 : 3

<i>Organization</i>	<i>Representative(s)</i>
Bharat Petroleum Corporation Ltd, Mumbai	DR T. SINGH ( <b><i>Convener</i></b> )
Standard Greases & Specialties Pvt Ltd	SHRI VIJAY DESHMUKH SHRI BABAJI PATIL ( <i>Alternate</i> )
Indian Oil Corporation (R & D), Faridabad	DR VEENA BANSAL DR NAVEEN POKHRIYAL ( <i>Alternate</i> )
Indian Oil Corporation Ltd, (Marketing Division), Mumbai	DR A. S. KATHAIT SHRI NITISH MITTAL ( <i>Alternate</i> )
Bharat Petroleum Corporation Ltd, Mumbai	SHRI VISHAL KUMAR SINHA
Ashok Leyland Ltd, Chennai	SHRI D. BALAKRISHNAN SHRI RAVI M. ( <i>Alternate</i> )
Association of State Road Transport Undertakings, Mumbai	REPRESENTATIVE
Bajaj Auto Ltd, Pune	SHRI K. RAJAN SHRI DEEPESH MUTKE ( <i>Alternate</i> )
Balmer Lawrie & Co Ltd, Mumbai	DR BALARAM GHOSH DR M. L. DAS ( <i>Alternate</i> )







## Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 2016* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

### Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

### Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: PCD 25 (13983).

### Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

## BUREAU OF INDIAN STANDARDS

### Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002  
Telephones: 2323 0131, 2323 3375, 2323 9402

Website: [www.bis.gov.in](http://www.bis.gov.in)

### Regional Offices:

### Telephones

Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	{ 2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	{ 2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	{ 265 0206 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	{ 2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	{ 2832 9295, 2832 7858 2832 7891, 2832 7892

**Branches :** AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE.  
DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI.  
HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW.  
NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi